Remarks

In view of the above amendments and the following remarks, reconsideration of the objection and rejections, and further examination are requested.

Claims 11-13 and 19 have been objected to as including a number of informalities. Claims 11-21 have been canceled without prejudice or disclaimer to the subject matter contained therein, and are replaced with new claims 22 and 23. As a result, withdrawal of this objection is respectfully requested.

Support for new claim 21 can be found at least in Figures 6 and 12 and support for new claim 22 can be found at least in Figures 8 and 14.

Claims 11 and 14 have been rejected under 35 U.S.C. §102(b) as being anticipated by Takayuki (JP 09-051638). Claim 12 has been rejected under 35 U.S.C. §102(e) as being anticipated by Lui (US 6,602,627). Claim 19 has been rejected under 35 U.S.C. §103(a) as being unpatentable over Takayuki in view of Colborn (US 2003/0167105). Claim 15 has been rejected under 35 U.S.C. §103(a) Lui in view of Jungreis (US 6,184,593). Claim 13 has been rejected under 35 U.S.C. §103(a) as being unpatentable over Lui in view of Mohan (US 5,334,877). Claims 16, 18 and 21 has been rejected under 35 U.S.C. §103(a) as being unpatentable over Lui in view of Mohan and Jungreis.

As mentioned above, claims 11-21 have been canceled and new claims 22 and 23 have been added. It is noted that the new claims no longer use "operable to" language, so the Examiner must give all the limitations in the body of the claims patentable weight. New claims 22 and 23 are patentable over the references relied upon in the above-mentioned rejections for the following reasons.

Claim 21 is patentable over Lui, Jungreis, Mohan, Colborn, Takayuki, and any combination thereof, since claim 21 recites a power supply system including, in part, a three-winding electronic transformer having a first bidirectional terminal for connection to a storage battery, a second bidirectional terminal for connection to a utility AC power source, a third bidirectional terminal for connection to a load, a high frequency transformer that matches and insulates a voltage on a storage battery side of the three-winding electronic transformer and a voltage on a load side of the three-winding electronic transformer, a first modulation/demodulation semiconductor switch connected to a winding at the storage battery side, a second modulation/demodulation semiconductor switch connected to a winding at a

utility AC power source side of the three-winding electronic transformer, and a third modulation/demodulation semiconductor switch connected to a winding at the load side; and a controller that controls operation of the three-winding electronic transformer by controlling operation of a switching device, wherein the controller controls the operation of the three-winding electronic transformer to (1) during a first time period, (i) supply AC power from the utility AC power source to the load while the storage battery is being charged by at least one of the DC power sources until the storage battery is fully charged and (ii) supply DC power from the storage battery to the load once the storage battery has been fully charged or if the utility AC power source fails, and (2) during a second time period, (i) supply the AC power from the utility AC power source to the load and (ii) convert the AC power from the utility AC power source into DC power and supply the DC power to the storage battery to charge the storage battery by a bidirectional function and a AC/DC converting function of the three-winding electronic transformer. None of the references, either individually or in any combination, discloses or suggests the three-winding electronic transformer and the controller as recited in claim 21.

Liu discloses an uninterruptible power supply system in which fuel cells, a utility AC source and a load are combined. In Liu, the fuel cells, the utility AC source and the load are connected to each other by a low frequency three-winding transformer. As understood from Figures 7-9, a conventional copper-iron type transformer is used as the three-winding transformer to stabilize the voltage to the load. The copper-iron type transformer has several drawbacks such as a large-size, low efficiency and high distortion, as compared with the three-winding electronic transformer recited in claim 21.

Based on the above discussion, Lui relates to an uninterruptable power supply system. It is apparent that Lui fails to disclose or suggest all of the features of the claimed three-winding electronic transformer or the controller as recited in claim 21. Namely, Lui fails to disclose or suggest a three-winding electronic transformer having a first bidirectional terminal for connection to a storage battery, a second bidirectional terminal for connection to a utility AC power source, a third bidirectional terminal for connection to a load, a high frequency transformer that matches and insulates a voltage on a storage battery side of the three-winding electronic transformer and a voltage on a load side of the three-winding electronic transformer, a first modulation/demodulation semiconductor switch connected to a winding at the storage battery side, a second modulation/demodulation semiconductor switch connected to a winding at

a utility AC power source side of the three-winding electronic transformer, and a third modulation/demodulation semiconductor switch connected to a winding at the load side.

Further, Lui fails to disclose or suggest a controller that controls operation of the three-winding electronic transformer by controlling operation of a switching device, wherein the controller controls the operation of the three-winding electronic transformer to (1) during a first time period, (i) supply AC power from the utility AC power source to the load while the storage battery is being charged by at least one of the DC power sources until the storage battery is fully charged and (ii) supply DC power from the storage battery to the load once the storage battery has been fully charged or if the utility AC power source fails, and (2) during a second time period, (i) supply the AC power from the utility AC power source to the load and (ii) convert the AC power from the utility AC power source into DC power and supply the DC power to the storage battery to charge the storage battery by a bidirectional function and a AC/DC converting function of the three-winding electronic transformer.

Regarding Jungreis, it discloses an uninterruptible power supply system which converts power from a main AC power source and power from various auxiliary power sources into DC power for integration in a DC bus 12-1. Further, batteries are provided to conduct an uninterruptible power supply operation. The system includes a three-phase DC-AC inverter and a transformer to supply AC power from the DC bus 12-1 to the load.

However, Jungreis fails to disclose or suggest a three-winding electronic transformer having a first bidirectional terminal for connection to a storage battery, a second bidirectional terminal for connection to a utility AC power source, a third bidirectional terminal for connection to a load, a high frequency transformer that matches and insulates a voltage on a storage battery side of the three-winding electronic transformer and a voltage on a load side of the three-winding electronic transformer, a first modulation/demodulation semiconductor switch connected to a winding at the storage battery side, a second modulation/demodulation semiconductor switch connected to a winding at a utility AC power source side of the three-winding electronic transformer, and a third modulation/demodulation semiconductor switch connected to a winding at the load side.

Further, Jungreis fails to disclose or suggest a controller that controls operation of the three-winding electronic transformer by controlling operation of a switching device, wherein the controller controls the operation of the three-winding electronic transformer to (1) during a first

time period, (i) supply AC power from the utility AC power source to the load while the storage battery is being charged by at least one of the DC power sources until the storage battery is fully charged and (ii) supply DC power from the storage battery to the load once the storage battery has been fully charged or if the utility AC power source fails, and (2) during a second time period, (i) supply the AC power from the utility AC power source to the load and (ii) convert the AC power from the utility AC power source into DC power and supply the DC power to the storage battery to charge the storage battery by a bidirectional function and a AC/DC converting function of the three-winding electronic transformer.

As for Mohan, it discloses an uninterruptible power supply system including an AC power source, a battery, and a load. In Mohan, respective insulated low frequency transformers are used for the AC power source, the battery, and the load.

However, Mohan fails to disclose or suggest a three-winding electronic transformer having a first bidirectional terminal for connection to a storage battery, a second bidirectional terminal for connection to a utility AC power source, a third bidirectional terminal for connection to a load, a high frequency transformer that matches and insulates a voltage on a storage battery side of the three-winding electronic transformer and a voltage on a load side of the three-winding electronic transformer, a first modulation/demodulation semiconductor switch connected to a winding at the storage battery side, a second modulation/demodulation semiconductor switch connected to a winding at a utility AC power source side of the three-winding electronic transformer, and a third modulation/demodulation semiconductor switch connected to a winding at the load side.

Further, Mohan fails to disclose or suggest a controller that controls operation of the three-winding electronic transformer by controlling operation of a switching device, wherein the controller controls the operation of the three-winding electronic transformer to (1) during a first time period, (i) supply AC power from the utility AC power source to the load while the storage battery is being charged by at least one of the DC power sources until the storage battery is fully charged and (ii) supply DC power from the storage battery to the load once the storage battery has been fully charged or if the utility AC power source fails, and (2) during a second time period, (i) supply the AC power from the utility AC power source to the load and (ii) convert the AC power from the utility AC power source into DC power and supply the DC power to the

storage battery to charge the storage battery by a bidirectional function and a AC/DC converting function of the three-winding electronic transformer.

Regarding (1) Colborn and (2) Takayuki, these references are relied upon as disclosing (1) a power supply system incorporating both a fuel cell and a battery and (2) a basic control circuit that is capable of switching between a battery and an AC source. However, neither of these references discloses or suggest the above-discussed features of claim 21.

Based on the above discussion, it is apparent that none of the references relied upon in the rejections discloses or suggests the three-winding electronic transformer and the controller as recited in claim 21. Therefore, no combination of these references can be made to render the present invention as recited in claim 21 obvious.

Regarding claim 22, it is patentable over Lui, Jungreis, Mohan, Colborn, Takayuki, and any combination thereof, since claim 22 recites a power supply system including, in part, a three-winding electronic transformer having a first bidirectional terminal for connection to a storage battery, a second bidirectional terminal for connection to a utility AC power source, a third bidirectional terminal for connection to a load, a high frequency transformer that matches and insulates a voltage on a storage battery side of the three-winding electronic transformer and a voltage on a load side of the three-winding electronic transformer, a first modulation/demodulation semiconductor switch connected to a winding at the storage battery side, a second modulation/demodulation semiconductor switch connected to a winding at a utility AC power source side of the three-winding electronic transformer, and a third modulation/demodulation semiconductor switch connected to a winding of the load side; and a controller that controls operation of the three-winding electronic transformer by controlling operation of the switching device, wherein the controller controls the operation of the three-winding electronic transformer to (1) during a first time period, (i) supply AC power from the utility AC power source to the load while the storage battery is being charged by at least one of the DC power sources until the storage battery is fully charged and (ii) supply AC power from DC power stored in the storage battery to the load once the storage battery has been fully charged or if the AC power source fails by demodulating the DC power into single-phase full-wave form per half cycle by the bidirectional converter, alternately reversing a high frequency modulation phase of the two unidirectional switches or the two pairs of unidirectional switches of the first modulation/demodulation semiconductor switch per half cycle of a utility AC power

frequency and then demodulating into sinusoidal wave AC output by the third modulation/demodulation semiconductor switch, and (2) during a second time period, (i) supply the AC power from the utility AC power source to the load and (ii) convert the AC power from the utility AC power source into DC power and supply the DC power to the bidirectional converter to perform a boost type rectifying operation at a high power to the DC power and supplying the DC power to the storage battery to charge the storage battery by the bidirectional function and the AC/DC conversion function of the three-winding electronic transformer. None of the references, either individually or in any combination, discloses or suggests the three-winding electronic transformer and the controller as recited in claim 22.

Based on the above discussion of the references relied upon in the rejections, it is apparent that none of the references discloses or suggests the three-winding electronic transformer and the controller as recited in claim 22. Therefore, no combination of these references can be made to render the present invention as recited in claim 22 obvious.

Because of the above-mentioned distinctions, it is believed clear that claims 21 and 22 are allowable over the references relied upon in the rejections. Furthermore, it is submitted that the distinctions are such that a person having ordinary skill in the art at the time of invention would not have been motivated to make any combination of the references of record in such a manner as to result in, or otherwise render obvious, the present invention as recited in claims 21 and 22. Therefore, it is submitted that claims 21 and 22 are clearly allowable over the prior art of record.

In view of the above amendments and remarks, it is submitted that the present application is now in condition for allowance. The Examiner is invited to contact the undersigned by telephone if it is felt that there are issues remaining which must be resolved before allowance of the application.

Respectfully submitted,

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